

The claims are directed to an apparatus for cleaning flat media carriers. The apparatus includes a detergent source or cleaning solution source, and an injection line connecting the source to a control valve. A metering pump is located in the injection line for pumping the cleaning solution from the source, to the control valve at a controllable pumping rate. Water is also provided to the control valve via a water inlet line. Nozzles are used to spray the water and cleaning solution toward one or more flat media carriers located on a rotor within a chamber. The use of a metering pump provides precise and consistent concentrations of cleaning solutions in the mixture of water and cleaning solutions. This provides improved cleaning and reduces costs.

Turning to the § 103 rejections at paragraphs 6-8 of the Office Action, the combination of Flynn and Cole et al. does not teach or suggest the apparatus recited in claims 9, 16, or 26. Flynn discloses a glassware washing system including a turntable for supporting glassware to be cleaned (col. 3, lines 17-20). The turntable is rotatable on demand between various stations, including a loading station, rinsing stations, a washing station, and a delivery station (col. 1, lines 39-43). The glassware is sprayed with detergent and water to clean and rinse the glassware as it is advanced from station to station (col. 4, lines 15-38).

As stated in the Office Action, Flynn does not disclose a metering pump for pumping detergent from a detergent source to a control valve at a controllable pumping rate. Cole et al., which discloses a tubular shaft cleaning system, is cited in the Office Action as disclosing a metering pump 137 for feeding detergent to a control valve 135 at a controllable rate. There is no suggestion in either reference, however, to combine their teachings to yield the claimed apparatus.

First, the cited references are directed to the non-critical ordinary cleaning processes for cleaning glassware and tubular shafts (contaminated with in-ground hazardous chemicals), not to the specialized process of cleaning flat media carriers. In these types of cleaning processes, it does not appear that variations in amounts of detergent, etc., would significantly matter.

Consequently, since neither the Flynn and Cole et al. references show a need for improved delivery of a detergent, or other cleaning solution, there is no suggestion to combine them. Neither reference addresses the problems solved by the claimed invention. Since a person of ordinary skill in the art could not reasonably be expected to look to these ordinary cleaning systems to solve the problems involved here, there is no motivation to combine them.

In view of the foregoing, it is submitted that the claims are in condition for allowance, and a Notice of Allowance is requested.

Dated: May 14, 2004

Respectfully submitted,

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**CLEAN SET OF PENDING CLAIMS:**

- 1-8. (Cancelled)
9. (Previously Presented) An apparatus for cleaning flat media carriers, comprising:
  - a rotor rotatably mounted within a chamber;
  - an array of nozzles arranged to spray fluid onto a media carrier on the rotor;
  - a control valve connected by a fluid line to one or more of the nozzles;
  - a water inlet line for providing water to the control valve;
  - a detergent source;
  - a detergent injection line connecting the detergent source to the control valve; and
  - a metering pump in the detergent injection line for pumping detergent from the detergent source to the control valve at a controllable pumping rate.
10. (Original) An apparatus according to Claim 9 further comprising a housing around the chamber.
11. (Previously Presented) An apparatus according to Claim 9 further comprising a boost pump connected to the water source for providing a desired inlet water pressure to the water inlet line.
12. (Cancelled)
13. (Cancelled)

14. (Previously Presented) An apparatus according to Claim 9 further comprising a recirculation line connected between the water inlet line and a water source for providing a recirculation path for water back to the water source.

15. (Previously Presented) An apparatus according to Claim 9 wherein the control valve comprises a mixing control valve for mixing the water and detergent.

16. (Previously Presented) An apparatus for cleaning media carriers, comprising:

a rotor rotatably mounted within a chamber;

a spray manifold having nozzles disposed in the chamber and arranged to spray fluid towards the rotor;

a control valve connected by a fluid line to the spray manifold;

a water inlet line for providing water to the control valve;

a detergent source;

a detergent injection line connecting the detergent source to the control valve;

a metering pump associated with the detergent injection line; and

means for controlling pumping rate of the metering pump to produce a desired detergent concentration in the detergent/water mixture provided to the spray manifold.

17. (Previously Presented) An apparatus according to Claim 16 further comprising a flow meter associated with the water inlet line for measuring a flow rate of water provided to the control valve.

18. (Previously Presented) An apparatus according to Claim 16 wherein the control valve comprises a mixing control valve for mixing the detergent and the water.

19. (Cancelled)

20. (Previously Presented) An apparatus according to Claim 16 further comprising a recirculation line connected between the water inlet line proximate the control valve and a water source for providing a recirculation path for water back to the water source.

21. (Cancelled)

22. (Previously Presented) An apparatus according to Claim 16 wherein the metering pump comprises a positive displacement diaphragm pump, and wherein said means for controlling a pumping rate of the metering pump comprises means for adjusting pumping speed.

23. (Previously Presented) An apparatus according to Claim 22 wherein said means for controlling pumping rate of the metering pump further comprises means for adjusting pump stroke length.

24. (New) An apparatus for cleaning flat media carriers, comprising:  
a rotor mounted to spin within a chamber;  
an array of nozzles arranged to spray a mixture of water and a cleaning solution toward the rotor;  
a control valve connected by a fluid line to one or more of the nozzles;  
a water inlet line for providing water to the control valve;  
a cleaning solution source;

a cleaning solution supply line connecting the cleaning solution source to the control valve;

a metering pump associated with the supply line for pumping cleaning solution from the cleaning solution source to the control valve at a controllable pumping rate; and

a return line connecting the supply line and the cleaning solution source for providing a return path for cleaning solution back to the cleaning solution source.

25. (New) An apparatus for cleaning media carriers, comprising:

a rotor mounted to spin within a chamber;

a spray manifold having nozzles arranged to spray a mixture of water and a cleaning solution towards the rotor;

a control valve connected by a fluid line to the spray manifold;

a water inlet line for providing water to the control valve;

a cleaning solution source;

a cleaning solution supply line connecting the cleaning solution source to the control valve;

a return line connected between the injection line and the cleaning solution source;

a metering pump associated with the supply line; and

means for controlling pumping rate of the metering pump to produce a desired cleaning solution concentration in the cleaning solution/water mixture provided to the spray manifold.

26. (New) An apparatus for cleaning flat media carriers, comprising:

a rotor rotatably mounted within a chamber;  
a plurality of nozzles arranged to spray a mixture of water and a cleaning solution toward the rotor;  
a control valve connected by a fluid line to one or more of the nozzles;  
a water inlet line for providing water to the control valve;  
a cleaning solution source;  
a supply line connecting the cleaning solution source to the control valve;  
and  
a metering pump associated with the supply line for pumping cleaning solution from the cleaning solution source to the control valve at a controllable pumping rate.

27. (New) An apparatus for cleaning wafer carriers, comprising:  
a chamber;  
a rotor rotatably supported in the chamber;  
a plurality of carrier holding positions on the rotor;  
a plurality of outer liquid spray nozzles arranged to spray inwardly toward the rotor;  
a plurality of inner fluid spray nozzles arranged to spray outwardly toward the rotor;  
a control valve connected by a fluid line to one or more of the spray nozzles;  
a water inlet line for providing water to the control valve;  
a cleaning solution source;

a supply line connecting the cleaning solution source to the control valve;  
and

a metering pump for pumping cleaning solution from the cleaning solution source to the metering valve at a controlled pumping rate.

28. (New) The apparatus of claim 27 wherein the cleaning solution source comprises a detergent source.

29. (New) The apparatus of claim 27 further comprising a plurality of inner and outer drying gas spray nozzles, arranged to spray a drying gas outwardly and inwardly, respectively, toward the rotor.



REPLACEMENT SPECIFICATION SHEET

[0056] The machine enables use of highly concentrated cleaning solutions, such as surfactants, detergents, and ozonated DI-water, for cleaning containers. Solvents, although not ordinarily preferred, could also be used. Surfactants are generally not flammable or explosive, and do not have the same environmental disadvantages associated with solvents. On the other hand, surfactants can be very expensive, e.g., \$40/gallon. Using the metering pumps to produce a precise and consistent concentration of surfactant for the DI-water/surfactant mixture, the system conserves surfactant. The system may also use the surfactant reclamation techniques of U.S. Patent No. ~~6,432,214~~ 6,432,214, hereby incorporated by reference.